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Applicant(s): LG Electronics Inc.

**COMMISSIONER**

## **[ABSTRACT OF THE DISCLOSURE]**

### **[ABSTRACT]**

Disclosed is a heater assembly installed in a toaster case of a microwave oven. The heater assembly 80 is configured of a heating plate 82 and a supporter 85. The heating plate 82 is shaped in rectangular form, the front end and the rear end of which having supporting slot 82' disposed thereon, and mounting bosses 83, 83' for fixing the heating plate 82. The supporter 85 includes a hanging portion 86 to be hanged on the supporting slot 82' and a spacer 87 to be supported by the heating plate 82. The spacer 87 maintains a regular interval between the heater assembly 82 and bread B in a constant manner, so as to heat the surface of the bread B uniformly and make easier to put in/draw out the bread from the appliance.

### **[TYPICAL DRAWING]**

FIG. 3

### **[INDEX WORDS]**

microwave oven, toaster, tray

**[SPECIFICATION]**

**[TITLE OF THE INVENTION]**

BREAD CRUMBS TRAY FOR MICROWAVE OVEN HAVING TOASTER

**[BRIEF DESCRIPTION OF THE DRAWINGS]**

- 5           FIG. 1 illustrates an exploded perspective view of a related art microwave oven;
- FIG. 2 illustrates an exploded perspective view of a microwave oven  
incorporating a toaster in accordance with the present invention;
- FIG. 3 illustrates a perspective view of the tray assembly included within the  
toaster in accordance with the present invention; and,
- 10          FIG. 4 is a plan view illustrating a heating plate in accordance with a preferred  
embodiment of the present invention.

**Reference numerals of the essential parts in the drawings**

	20: cavity assembly	21: front plate
	22: cavity	23: electrical device chamber
15	24: cavity door	25: door handle
	27: outer case	30: toaster
	32: toaster panel	33: fixing hook
	34: hinge hole	40: toaster door
	41: door panel	42: hinge pin
20	43: toaster door handle	50: toaster case
	51: case front plate	52: case mouth
	53: case rear plate	53': spring hook
	54: moving slot	60: toaster front
	62: toaster entrance	64: lever slot
25	70: tray support	72: bushing

74: tray	74a: extensions
74b: hook	74c: projection
77: spring hook	79: spring
80: heater assembly	90: crumb tray
91: tray body	91f: side wall
91h: fastening hole	92: crumb tray handle
94: coupling arm	95: extrusion
97: fastening hook	98: rear flange

## **[DETAILED DESCRIPTION OF THE INVENTION]**

### **10 [OBJECT OF THE INVENTION]**

### **[FIELD OF THE INVENTION AND DISCUSSION OF THE RELATED ART]**

The present invention relates to a microwave oven with a toaster, and more particularly, to a heater assembly, inside of which are installed a plurality of heating plate s facing with each other, formed in an inner space of the toaster.

15 Generally, microwave ovens are cooking appliances for heating an object by the application of microwaves. Construction of the microwave oven will now be described.

And the microwave oven includes generally a cavity 2 in which an object or food is heated by microwaves. The cavity is formed in an interior of a cavity assembly 1. The cavity 2 is closed and opened by the cavity door 4.

20 A component chamber 10 that accommodates several electrical equipment components for generating microwaves is positioned at one end of the cavity 2 and is covered by an outer case 6. The electrical equipment includes a magnetron 12 for generating microwaves, a high-voltage transformer 14 for supplying a high voltage to the magnetron 12, and a fan 16 for producing airflow in the cavity 2 to cool the heated  
25 electrical equipment.

Since the microwave oven heats the cooking object by means of microwaves, it is improper to toast bread. Accordingly, microwave ovens capable of toasting bread, as well as cooking or heating the cooking object by means of microwaves have been developed.

5 To cope with the above request, there is designed a microwave oven having a toaster case positioned in front of an electric equipment component chamber 10. The toaster case is generally installed a heater assembly for correspondingly heat the both surfaces of the bread being vertically stood.

However, the related art has some several problems.

10 First, the heater formed in a rectangular shape should be installed in the toaster case in a predetermined distance and then a sliced bread is placed therebetween. In this instance, if the bread is not positioned each surface of the bread distanced from the heater in similar interval, the surface of the bread will be heated unevenly.

Second, if the bread is not placed in an exact position, an edge part of the bread  
15 might be caught on a toaster mouth and it may not be pulled out.

#### **[TECHNICAL TASKS TO BE ACHIEVED BY THE INVENTION]**

Accordingly, the present invention is directed to a microwave oven with a toaster that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

20 An advantage of the present invention is to provide a microwave oven having a toasting function, besides a compact appearance.

#### **[PREFERRED EMBODIMENTS OF THE INVENTION]**

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a microwave oven provided  
25 with a cavity for heating food placed therein and a component chamber that

accommodates several electrical equipment components for generating microwaves to the cavity, the microwave oven including a plurality of heating plates in a rectangular shape formed inside the toaster case with having regular intervals therebetween, and a supporter formed by hanging on a surface of the heating plates to maintain the distance  
5 between the heater and bread, the supporter made by fracturing one wire.

The heating plate is provided at both ends with a plurality of supporting slots for receiving the supporters, and a hanging portion inserted into the supporting slot and formed at both ends of the supporter.

The supporter has a spacer that is in contact with a surface of the heating plate,  
10 so that an interval between the heating plate and the supporter is constantly maintained.

The heating plate is provided at an end thereof with a mounting boss which is inserted and fixed into the case.

The supporting slots are formed on both sides of the mounting boss which is disposed on the front end of the heating plate.

15 The above structure enables to maintain the constant interval between the heating plate and the bread, which make the bread put in and drawn out from the toaster case in an easy manner.

Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

20 Referring to FIG. 2, a cavity 22 is formed in an interior of a cavity assembly 20, and a component chamber 23 is positioned close to the cavity 22. An item to be cooked is heated by means of microwaves. The component chamber 23 is provided therein with several electronic equipment components for generating microwaves. The microwave oven shown in FIG. 2 includes a front plate 21.

The cavity 22 is opened and closed by a cavity door 24. If the cavity door 24 is closed, the cavity door 24 is in contact with the front plate 21 to cover the cavity 22. The cavity door 24 includes a door handle 25 which is used by a user to open or close the cavity door 24.

5 The cavity assembly 20 and the component chamber 23 are covered by an outer case 27 defining outer surfaces of upper and side portions of the microwave oven.

A toaster 30 is installed in the component chamber 23 in such a way that it penetrates the front plate 21. The toaster 30 according to the present invention will now be described in detail with reference to Fig. 3.

10 A toaster panel 32 is provided at a front side of the toaster 30. Material of the outer surface of the toaster panel 32 is similar to or the same as that of the cavity door 24, so that the toaster panel 32 provides the microwave with a smooth front surface together with the cavity door 24 and a toaster door 40, as shown in Fig. 2. A rear of the toaster panel 32 is provided with a plurality of fixing hooks 33. The reference  
15 number 34 indicates a hinge hole.

The toaster 30 further includes a toaster door 40 hinged to the toaster panel 32. To this end, the toaster panel 32 has a hinge hole 34, while the toaster door 40 has a hinge pin 42. The toaster door 40 may rotate around a hinge axis formed by the hinge pin 42 so as to be opened and closed. The material of the outer surface of the door  
20 panel 41 may be similar or identical to that of the toaster panel 32, so that the door panel 41 provides the microwave with a smooth front surface together with the cavity door 24 and toaster panel 32. The hinge pin 42 is positioned at a lower portion of the door panel 41 in such a way that the toaster door 40 is opened and closed by the rotation itself. The door panel 41 further includes a toaster door handle 43, so that the  
25 user easily opens and closes the toaster door 40.

The toaster 30 further includes a toaster case 50 installed at the rear side of the toaster panel 32. The toaster case 50 is coupled to the toaster panel 32 through a portion of the front plate 21 corresponding to the front side of the component chamber 23. The toaster case 50 is made of metal and provides a space for toasting the slice of bread.

There is a case front plate 51 at the front of the toaster case 50. The case front plate 51 includes two case mouths 52, each through which a slice of bread may be placed into or removed from the toaster case 50. Meanwhile, there is a case rear plate 53 at the rear of the toaster case 50. Two spring hooks 53', which engage one end of each spring 79, are provided at a lower portion of the case rear plate 53. The case rear plate 53 has a heater slot 53s for receiving a rear mounting boss 83'.

The toaster case 50 has a pair of moving slots 54 in or on its lower side walls. The pair of moving slots 54 extend toward the rear of the toaster case 50 in a direction parallel to a left or right edge of the toaster case 50. A bushing 72 is movable along each moving slot 54.

A toaster front 60 is provided at the front of the case front plate 51 and is positioned in the toaster panel 32. The toaster front 60 has two rectangular toaster mouths 62, which are exposed when the toaster door 40 is opened. Each of the toaster mouths 62 is coupled to a respective case mouth 52 of the case front plate 51. Two lever slots 64 are at the lower portion of the toaster front 60. The lever slots 64 are substantially vertical or parallel to the long side of the toaster mouths 62. One of two connecting levers 76 moves through a respective lever slot 64.

A protector 65 is interposed between the toaster front 60 and the toaster panel 32. The protector 65 is made of insulating material to protect heat from being transferred to the toaster panel 32 from the toaster front 60.



A tray support 70 is installed inside the toaster case 50. There are disposed bushings 72 at right and left sides of the tray support 70. The bushing 72 supports the tray support 70 and is moved along the moving slot 54 provided on each side of the toaster case 50. The tray support 70 supports at least one tray 74 in which each slice of bread is vertically positioned. The number of trays 74 is the same as the number of toaster mouths 62.

One end of the connecting lever 76 is coupled to the lower portion of the toaster door 40. The other end of the connecting lever 76 is hinged to the bushing 72. The connecting lever 76 is penetrated through the lever slot 64 and protruded to the front side of the toaster front 60.

The one end of the connecting lever, which is hinged to the bushing 72 is connected to one end of the spring 79. The other end of the spring 79 is hanged on spring hook 53' of the toaster case 50. The spring 79 pulls the end of the connecting lever 76 toward the spring hook 53'.

There is a heater assembly 80 mounted in the toaster case 50. The heater assembly is configured of a heating plate 82 and a supporter 85.

The heating plate 82 is generally formed in rectangular shape, as shown in Fig. 4, and includes of three silicon plates and a heat coil. The silicon plates are composed of a center plate with the heat coil wound and outer plates adhered to both sides of the center plate. The heating plate 82 is formed with a plurality of supporting slots 82' for receiving a supporter 85. A pair of supporting slots 82' are provided at the front and rear ends of the heating plate 82, respectively.

Front mounting boss 83 and a rear mounting boss 83' are provided at the front and rear ends of the heating plate 82, respectively. The front mounting boss 83 is coupled to the rear surface of the case front plate 51, while the rear mounting boss 83'

is inserted into the heater slot 53s of the case rear plate 53. It is preferable to form the supporting slot 82' on both ends of the front mounting boss 83. The reason is to make the supporter 85 more stable.

5 The supporter 85 may be formed with bending one wire, as illustrated in detail in FIG. 5. Referring to FIG. 5, the supporter 85 has a length corresponding to a distance from the front end of the heating plate 82 to the rear end thereof.

A hanging portion 86 is provided at both ends of the supporter 85 and is positioned in the supporting slot 82'. A plurality of spacers 87 are positioned at regular intervals along the supporter 85. The spacer 87 is in contact with the surface of the heating plate 82 so that an interval between the heating plate 82 and the supporter 85 is maintained to prevent bread B from directly contacting the heating plate 82. The hanging portion 86 and the spacer 87 protrude in the same direction.

The relationship of the dimensions and relative positions of the heating plate 82 and the supporter 85 will now be described with reference to Figs 4 and 5. A distance b between the supporting slots 82' is equal to or shorter than a distance c between insides of the hanging portions 86. A distance d between the front and rear ends of the heating plate 82, excepting the distance between the mounting bosses 83 and 83', is equal to or longer than a distance e between outsides of the hanging portions 86. The difference between distances c and e corresponds to twice the thickness of the wire forming the supporter 85.

A crumb tray 90 is slidably received and installed in the toaster case 50 through the lower portion of the toaster panel 32. To this end, a crumb tray handle 92 is provided at a front portion of the crumb tray 90. The crumb tray handle 92 is positioned between the hinge pins 42 of the toaster door 40. Material of the crumb tray handle 92 is the same as that of the door panel 41.

The operation of the heater assembly according to the present invention will now be described in detail.

The heater assembly 80 includes a plurality of supporters 85 formed on the heating plate 92 in the rectangular shape. The hanging portion 86 is inserted into the supporting slot 82', so that the supporter 85 is adjacent to the heating plate 92. At that time, the supporter 85 is stably fixed to the heating plate 92 under the conditions of the distances b, c, d and e.

Of course, since the distance d between the front and rear ends of the heating plate 82 is equal to or longer than the distance e between the outsides of the hanging portions 86, it is necessary to slightly bend the heating plate 82 to deform it upon first assembling it with the supporter 85.

Meanwhile, a plurality of the heating plates 82 are vertically installed in the toaster case 50 at a desired interval. As one example, three heating plates 82 are provided in the toaster case 50, so that two slices of bread B can be simultaneously heated. In case of the heating plate 82, which is positioned at the center, the supporters 85 are provided at both sides of the heating plate 82.

At that time, an interval between the supporters 85 installed at the adjacent heating plates 82 is selected to be slightly wider than a width of the bread B. The bread B inserted between the heating plates 82 faces the heating plates 82, with both sides of the bread being supported by the supporters 85. By constantly maintaining the interval between the heating plate 82 and the bread B, both sides are uniformly heated.

Because the bread B is vertically supported by the supporters 85, the front end of the bread is smoothly moved, without being caught by the case front plate 51 when being removed from the toaster.

Next, the supporters are used for 8 as a whole, having the same forms no matter what their position would vary on the heating plate 82. Accordingly, the mold amount for manufacturing the supporter 85 can be minimized.

While the present invention has been described and illustrated herein with  
5 reference to the preferred embodiments thereof, it will be apparent to those skilled in the art that various modifications and variations can be made therein without departing from the spirit and scope of the invention. For example, the toaster case 120 could be installed on any other sides besides at the front portion of the component chamber 100. Moreover, the toaster case 120 can be opened and closed with a door, the toaster being  
10 disposed at a front side of a microwave oven.

#### **[EFFECT OF THE INVENTION]**

As described above, the microwave oven of the present invention includes the heater assembly having the supporters for maintaining the interval between the heating plate and the bread. The heating plate has a heat coil with a winding density that is  
15 optimized depending upon the position of the heating plate in the toaster. Accordingly, the bread may be uniformly heated over the whole surface.

Furthermore, since the bread is supported at a correct position by the supporter, the process of removing the bread from the toaster may be correctly performed.

Also, the plurality of supporters are the same in forms, so that the supporters can  
20 be made by only one mold without using a separate implement.

**What Is Claimed Is:**

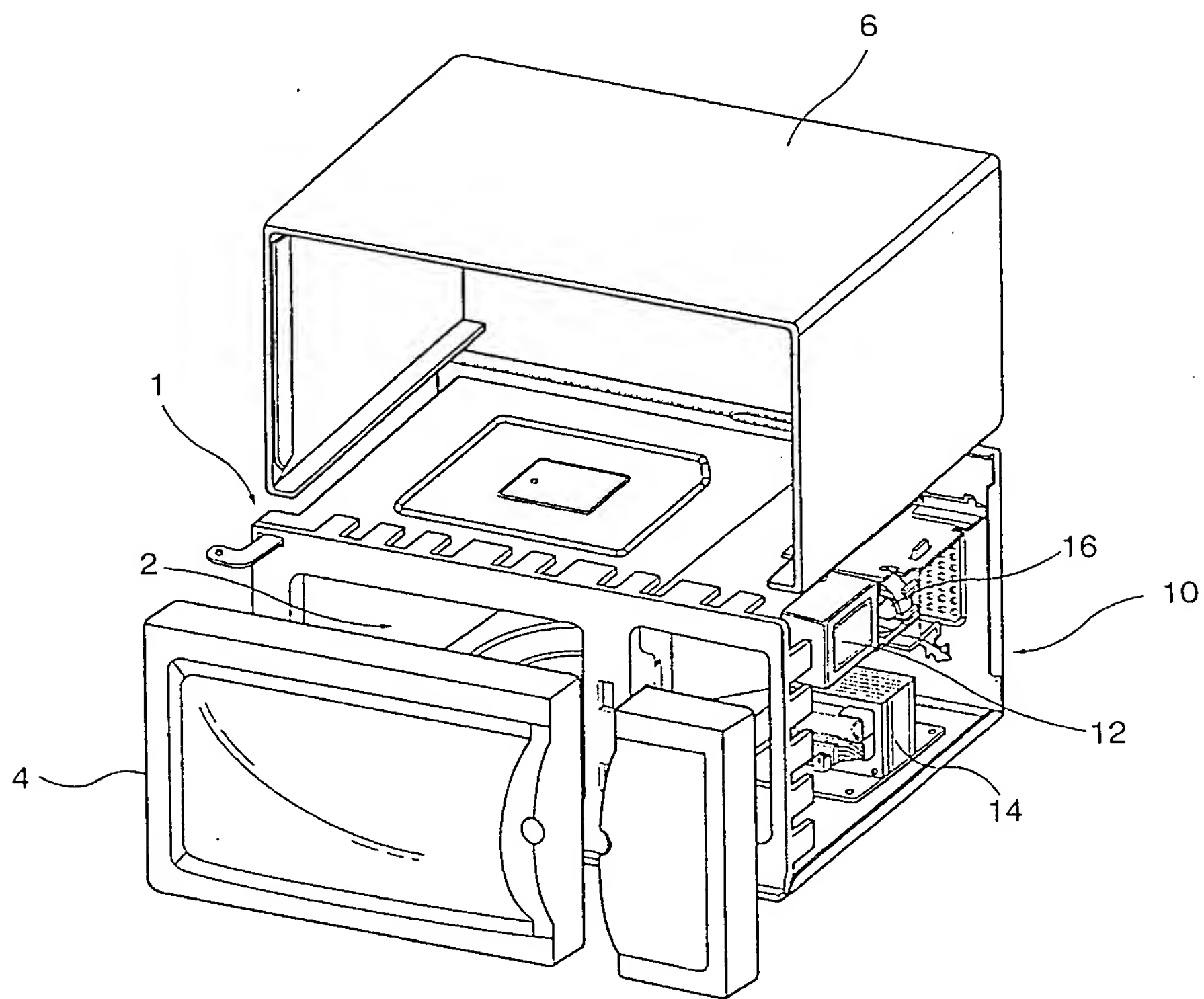
1. A microwave oven provided with a cavity for heating food placed therein and a component chamber that accommodates several electrical equipment components for generating microwaves to the cavity, the microwave oven comprising:

a plurality of heating plate s in a rectangular shape formed inside the toaster case with having regular intervals therebetween; and

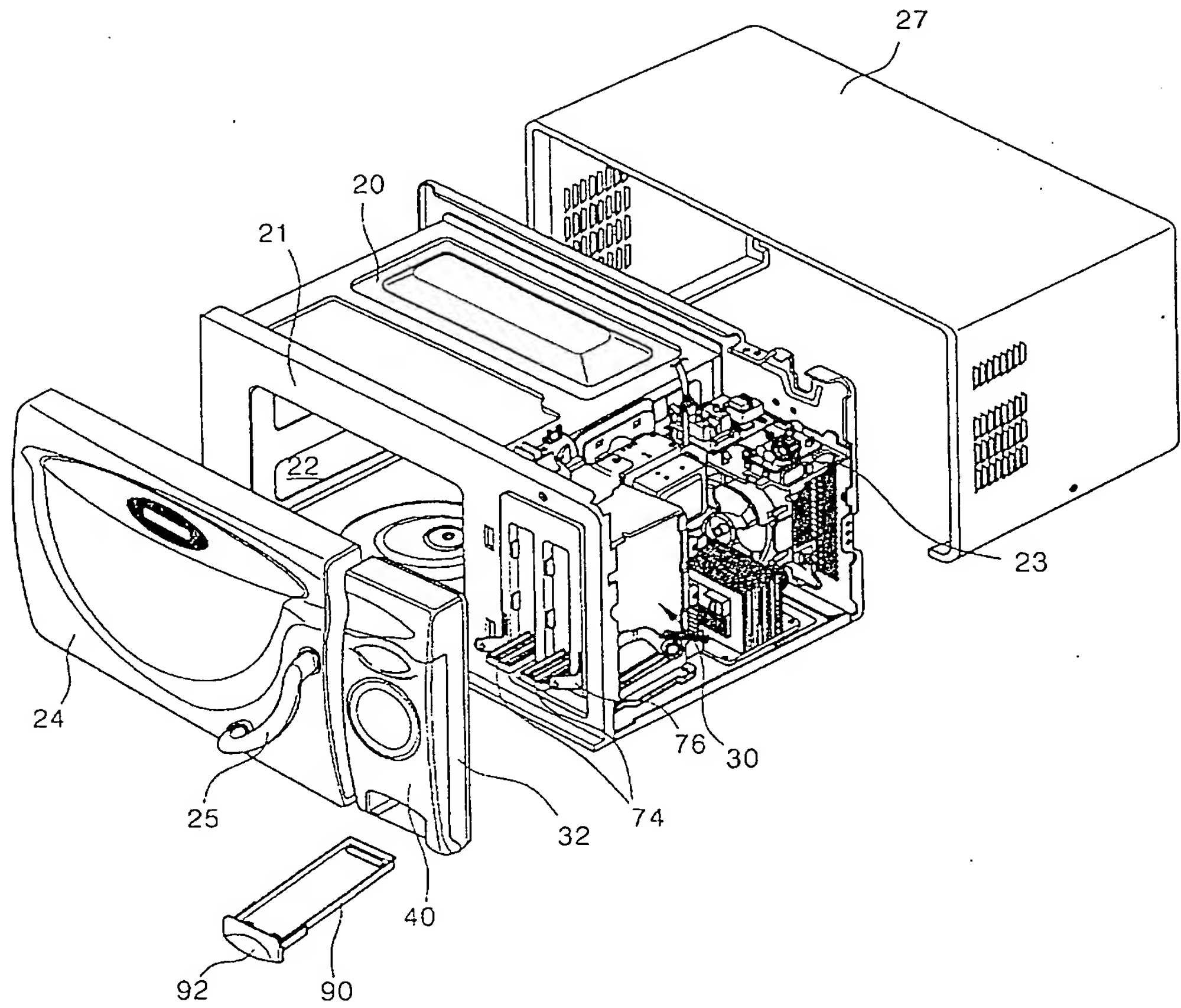
a supporter formed by hanging on a surface of the heating plate s to maintain the distance between the heater and bread, the supporter made by fracturing one wire.

# [Drawings]

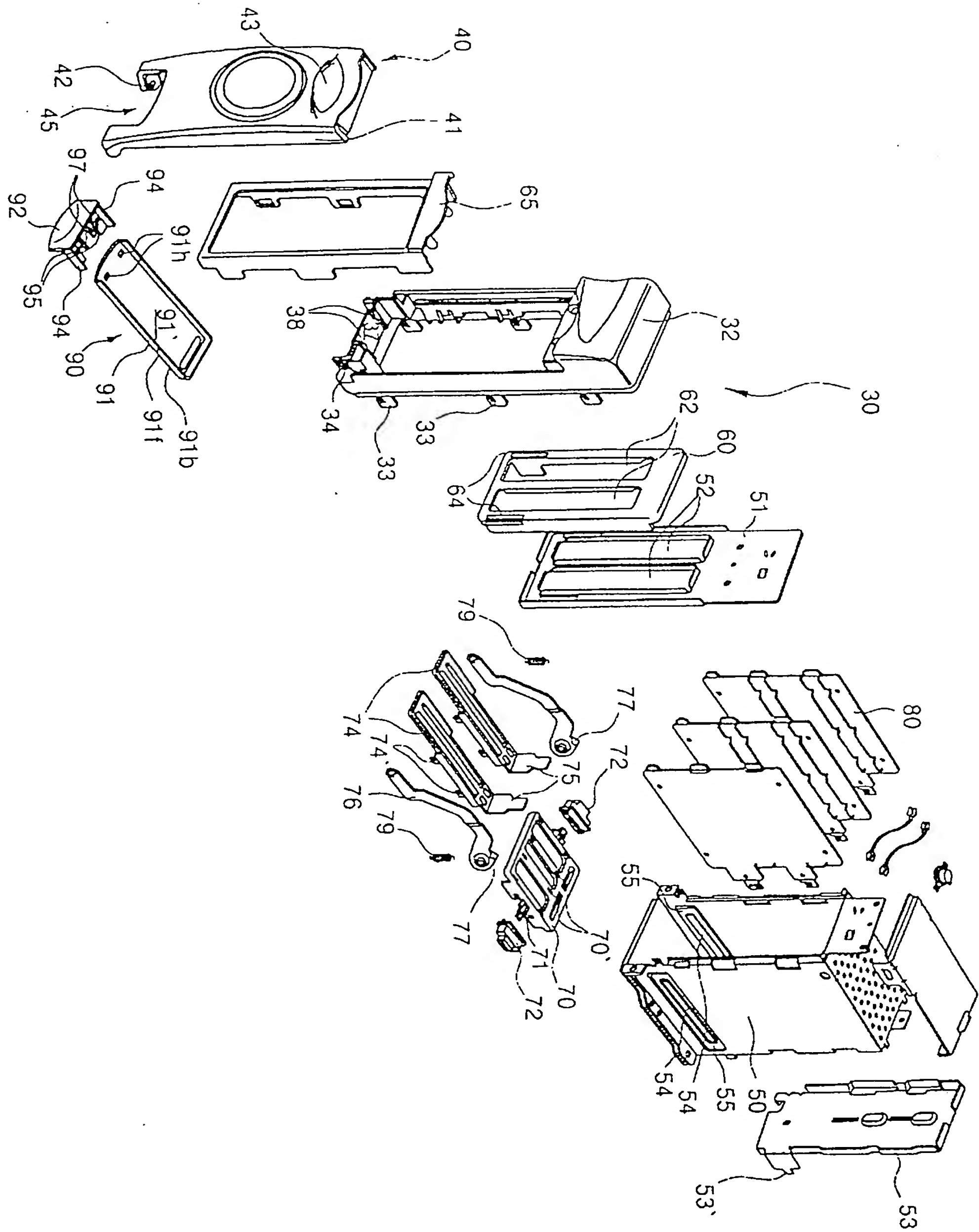
[FIG. 1]



[FIG. 2]



[FIG. 3]





[FIG. 4]

